ANTENNA TOPIX

THE RHOMBIC

CB's "DREAM ANTENNA"

PART I

By GORDON J. KING, 17W2432

Have you ever dreamed of an antenna system that would **amplify** your CB transmitter signal to a level comparable with say a 250 watt transmitter?

You have? Well read on, for here is just such an antenna, with all the physical problems and erection headaches that must go along with anything so powerful and effective.

The Rhombic antenna is wire in construction, with a sprinkling of ceramic insulators thrown in to keep it taut and away from nearby foreign objects. The Rhombic antenna is large . . . very large . . . and only those CB'ers with a fair piece of property to play on will want to tackle its construction.

As diagram one shows (a horizontally mounted Rhombic), the beast is diamond shaped and fires in one direction . . . away from the end to which the feed line is attached. You really can't imagine how directive a horizontal rhombic is until you run out in front of one with a horizontal dipole (at a distance of five miles or so) and a field strength meter. On my test installation in Kansas, I found a meter reading of '200' (just relative field strength—forget how strong this may or may not be) in a path 100 yards across at five miles, and then a reading of only '10' 150 yards either side of the center 100 yard strong signal area point. Running around to the sides of the antenna, and keeping about 5 miles "out", the signal level registered from 0 to 15 all of the way around. In other words the signal off the front of the Rhombic is nearly 16 times as strong, in relative field strength, as off the nearest competing side lobe point.

Truly, this is a directional antenna!

So what good is it? You can't rotate it, it makes a poor clothesline 30-50 feet above ground, and it may cost you as much as $50.00 to install.

In my installation, I need to cover 37 miles over flat mid-western grassland with consistent signals S5 over better. I don't want to be bothered by skip, and if a mobile unit happens across my channel someplace between here and my 37 mile communications point, I don't want him clobbering my communications. On top of this, I don't want my signals heard in any of the neighboring towns, **if I can help it!**

The Rhombic fills this bill because it allows me to pinpoint my 5 watt signal within a fraction of a mile at 37

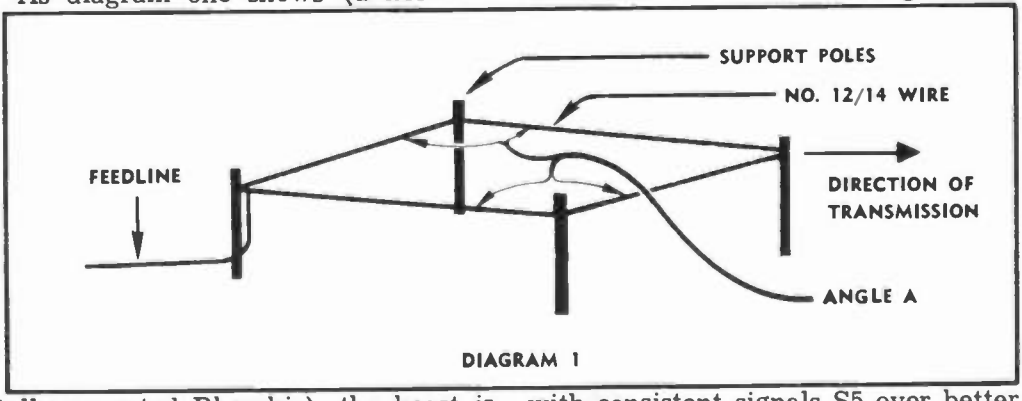

DIAGRAM 1

(*Continued on Page* 35)

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(*Continued from Page* 17)

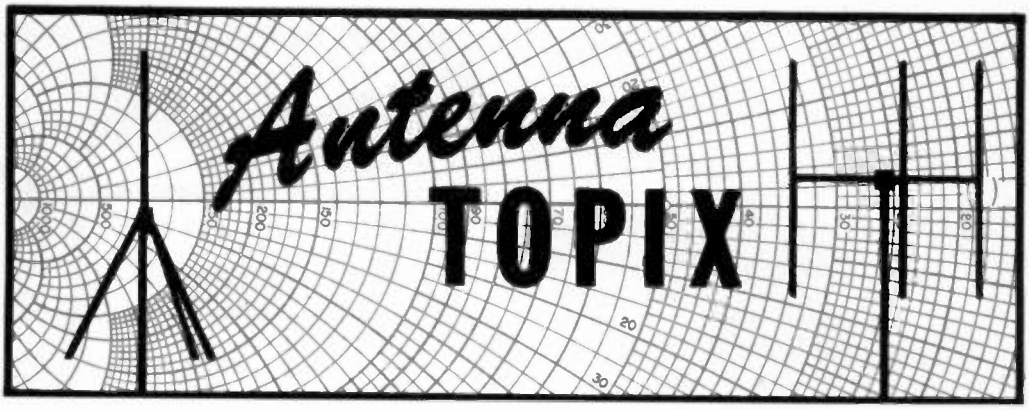
miles, it is horizontal and does not react to vertical mobile or other CB base station antennas (also vertical), and its signal is held so close to the ground that skywave (skip) DX is virtually non-existant except on the very worst days.

You probably don't have these requirements for an antenna, so I will give you a few ideas I have on how this antenna might serve your needs. Vertically mounted, the Rhombic could be orientated on a near-by town or center of CB activity (say 25-50 miles away) and you would be assured of rock solid contacts into the area **all of the time.** If you operate a delivery type business, you may have one direction out of town which you travel a little further than the rest. A Rhombic orientated in that direction would give you rock solid mobile coverage (if the rhombic is vertical, like mobile antennas, and majority of base station antennas) out to 25-35 miles under even the most adverse conditions.

The Rhombic, you see, is a high gain antenna. Depending on its size "per leg", gains up to 20 db over a reference dipole are not uncommon. In terms of "effective radiated power", this means your average 2.5 watt output CB transceiver will sound like 250 watts when pushed through a 20 db gain Rhombic. This is a healthy improvement, and that same 20 db of antenna gain will help just as much on receive. Although this hasn't yet been borne out in experimentation, two 5 watt CB stations operating over essentially flat terrain, and driving a Rhombic antenna at each end (assuming 20 db gain for each antenna) should be able to communicate over a distance of not less than 80 miles day in and day out with very consistent signals.

Next Month—Instructions for building your own Rhombic.

10-7



CB's DREAM ANTENNA: THE RHOMBIC

PART II — Building the Rhombic

By GORDON J. KING, 17W2432

The author has had no experience with vertically mounted Rhombic antennas. It is assumed, however, that all one needs to do is to flip the "diamond" up on its side as shown in figure 3, mounting it sufficiently above ground at point B to be at least one wavelength between the insulator and the ground level.

The horizontal Rhombic antenna shown is a terminated device, with a terminating "load resistor" across the wires at point A in figure 4. This resistor is an 800 ohm noninductive (carbon-core only!) 5 watt type. This resistor is very important, as it keeps your signal from floating off the back side of the antenna.

Point B in diagram 4 shows an insert, 4A, which explains how you match the 800 ohm Rhombic antenna to your 52 ohm coaxial transmission line. This is a "Q matching section," constructed from ½ inch O.D. aluminum or copper tubing, spaced apart by plastic spacers 1-5/16th inches center to center. The Q Matching section is 8 feet 9½ inches long, from the top where it attaches to

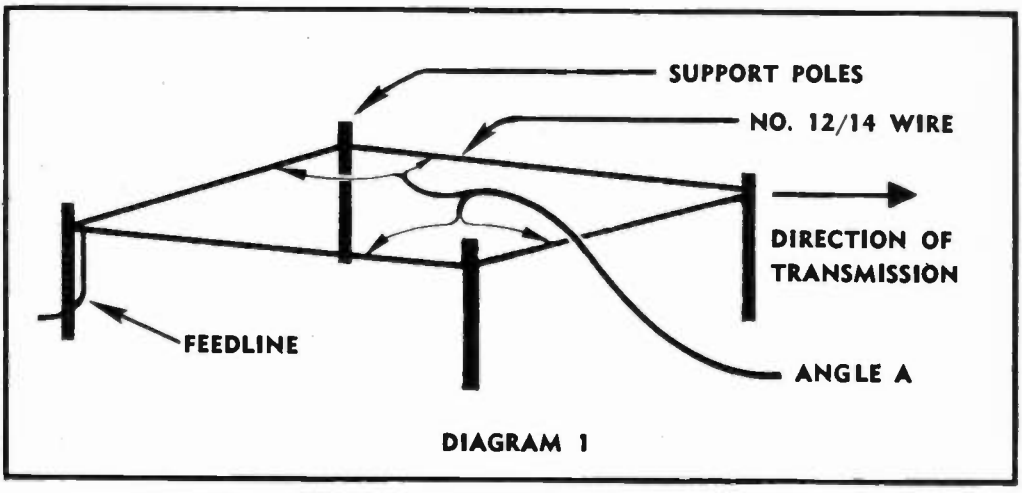


DIAGRAM 1

The basic horizontally-mounted rhombic, as described in the March CBH.

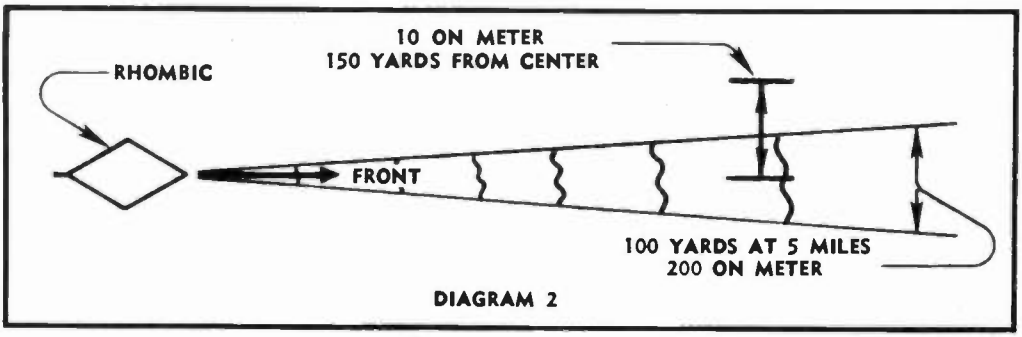


DIAGRAM 2

The signal path from a rhombic is pretty potent. Five miles from the beam width is about 100 yards across. 150 yards from the center of the beam the signal gives a 95% lower S-meter reading.

the *fire-end* of the Rhombic, to the base where the RG-8/U coax cable from your transceiver attaches on. The Q Matching section transforms your feed impedance to 800 ohms, matching the antenna. If there is sufficient interest in this matching system, we can go into it further at a later time.

Length W is equal on each of the four legs on the Rhombic. A table (table one) lets you decide how large or how small you wish to make your Rhombic. Gain figures are also given. Distances B and C are also given for each of the three W dimensions. These vary with size (W).

It is suggested that you mount the Rhombic on wooded treated poles (try your local phone or power company for some they have recently pulled from the ground), using heavy duty egg insulators where they are indicated in diagram 4, to keep the wire away from the pole. Nylon rope, running through

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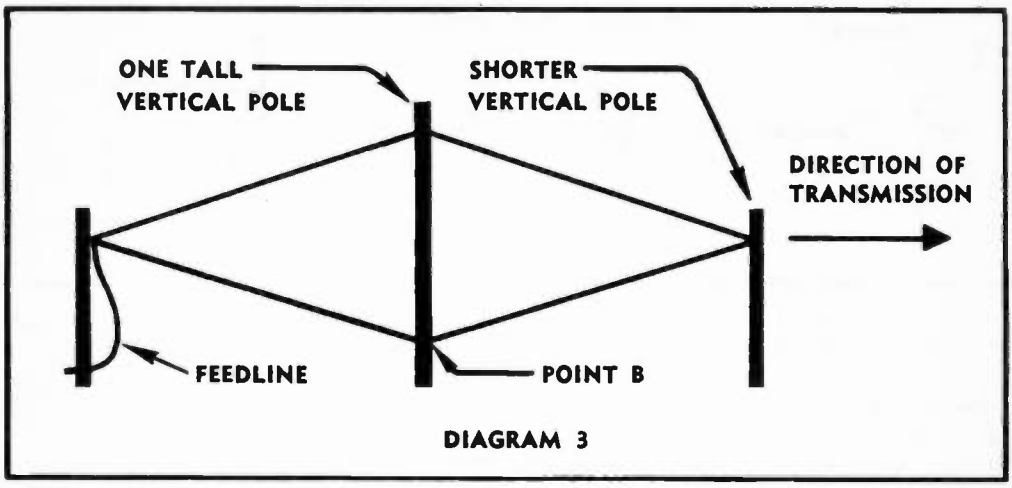
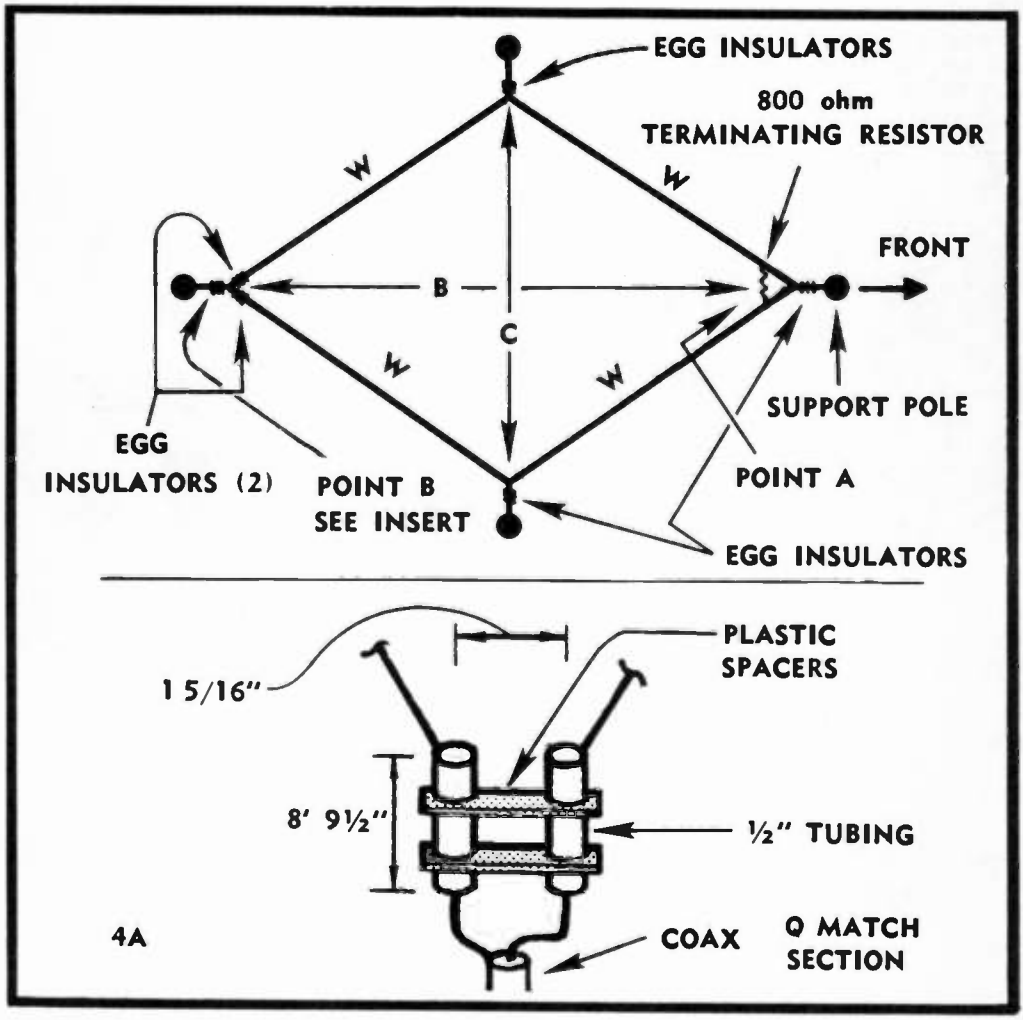


DIAGRAM 3

Vertical mounting of a rhombic requires only 3 poles. Below, you get the layout for actual construction. (see text).



Wave lengths per leg (length W)	Angle A (diagrom 1)		Foot Meosurement (length W)	Goin in db
2	70	degrees	63	4.25
4	50	"	126.5	6.0
8	35	"	252	9.25
12	22.5	"	378	12.5

Diogrom 1. This will give you the different meosurements ond goins for the vorious sizes of rhombics.

pulleys mounted at the top of the four poles, can attach to the back of each insulator. This will allow you to erect the antenna on the ground level, and then pull it into place with the nylon rope over the pulleys. The rope-pulley combination will also aid you in leveling off the antenna (horizontal to the plane of the earth). I have small bags filled with sand suspended on the bottom of my nylon ropes. This allows the wires to give in the winds we have here in the midwest (as the winds blow the antenna wire grows taut, pulling on the nylon rope. The sandbags raise and "give" with the wind, but lower again because of gravity when the wind slows down or stops).

No. 12 or 14 copper clad steel wire is recommended for the actual construction. The steel adds strength, while the copper gives the antenna electrical conductivity.

I hope you find this to be a very useful antenna, if you too have a CB communications problem over long haul distances. If any antenna design known to man will do the job, the Rhombic is it!

10-7

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BUILD THE SSB SUPER KILLER-V ANTEN

WATT NA

By Bill McGuire SSB/3A777

Ever wonder what you'd sound like with a 1,200 watt Sideband signal? Ever fantasize how it would be to have that signal while still operating legally on 27 MHz? Yup, you can do it—you don't really have to run 200 watts (you stay with your FCC approved 12 watt PEP too), you just *sound* like you're running 200 watts! This thing works with AM rigs, too, of course—except your stock AM rig (4 watts output) will sound like *only* 70 watts!

This is the antenna that can do it for you, complete with all of the physical and "putting the damned thing up" problems which must inevitably go along with anything so blasted advantageous. It's a monster and unless you've got some elbow room to put this thing up, you'll just have to let it remain a *dream* antenna in the most literal sense of the term.

What we are dealing with here is, to put it bluntly, an antenna technically termed a Rhombic type. It uses a lot of wire along with a sprinkling of ceramic insulators to keep it taut and away from foreign objects. It's large—very large—but it's truly spectacular.

As Diagram 1 shows, the beast is diamond shaped and fires in only one direction, that direction being opposite from the end from which the signal is fed into it. The diagram shows how I built my flat-side (horizontally polarized) *Super Killer-Watt*, and you really can't imagine exactly how directional it is until you run out in front of one at a distance of about 5 miles with a field strength meter. On my test installation I found a reading of "200 (just relative strength, forget how strong this may or may not be) in a path 300 feet across at 5 miles—and then a reading of only "10" at 450 feet to either side of the center of the 300 foot strong signal area point. Running around the to the sides of the antenna, and remaining about 5 miles "out," the signal level registered from 0 to 15 all of the way around. In other words, the signal off the front end of the Rhombic is nearly 16 times as strong (in relative field strength) as off the nearest competing side lobe point! To say it's directional is almost an understatement.

SO WHAT GOOD IS IT?

Well, you can't rotate the thing and it makes a poor clothesline—but it does really have a knack of giving you the total command over just about any frequency you might decide to use for communication—albeit, total command only in the basic direction in which it is pointed. If you live in the *boonies* this will give you a chance to have what amounts to local coverage of the operators in a major city many miles off into the distance, and without making a nuisance of your signal to operators using the same frequency in areas off to your sides

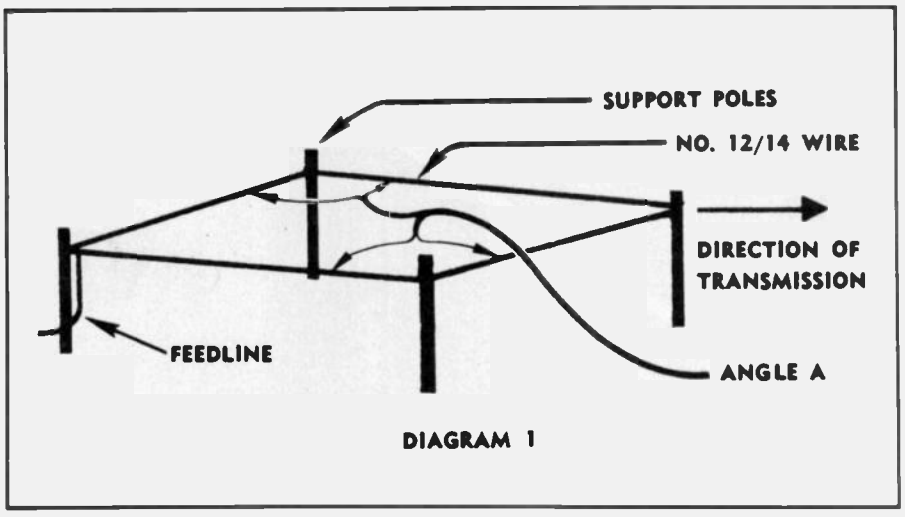

DIAGRAM 1

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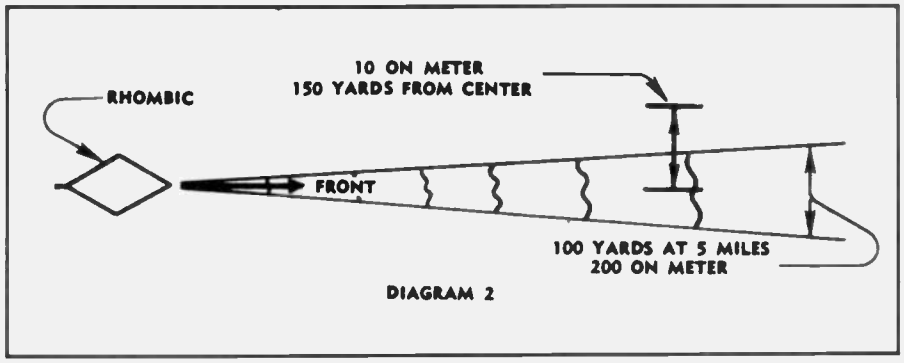

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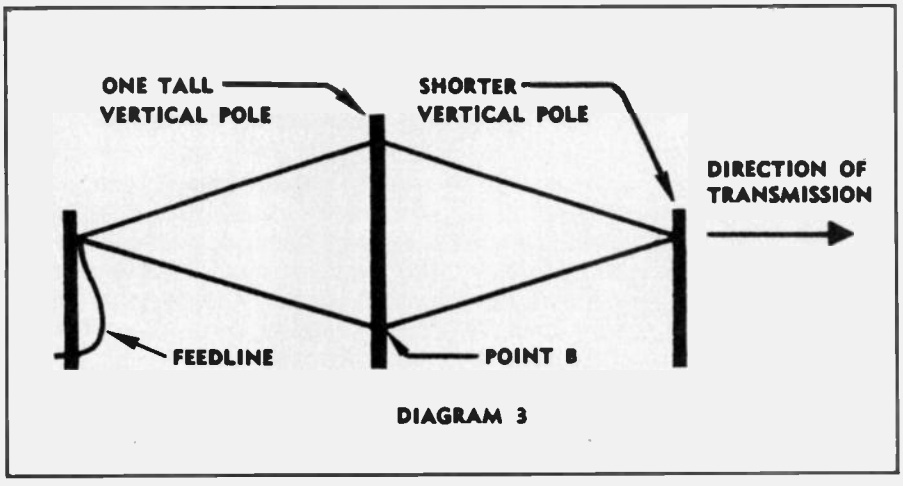

DIAGRAM 3

Vertical mounting of a rhombic requires only 3 poles. Below, you get the layout for actual construction. (see text).

and towards the rear of your signal pattern. You can, in fact, almost pinpoint your signal within a fraction of a mile at 35 to 50 miles. Since my own Super Killer-Watt is installed flat sided, it doesn't bother with vertically-polarized signals from mobile units—all I'm interested in talking to are other *flat-side* operators.

You may not have these exact requirements for an antenna, so I'll give you a few ideas how such an antenna might serve other needs. Mounted in a vertical mode, the *Super Killer-Watt* could be oriented on a city or town off into the distance and you'd be assured of rock-solid contacts with all vertically polarized base and portable stations.

The *Super Killer-Watt* is truly a gain antenna of the highest order. Depending upon its size "per leg," gains of up to 12.5 db over a reference dipole aren't uncommon. In terms of ERP (effective radiated power), this means that your legal 12 watt PEP Sideband rig will come out of the business end of a 20 db Rhombic sounding like it was 200 watts! A 4 watt AM rig will sound like 70 watts. This is a healthy improvement, and that same antenna gain will help out equally on receive! Imagine what the communications reliability of two similarly equipped distant base stations—easily well over 100 miles day in and day out with constantly 100% copy. I won't even get into what kind of ERP it might produce when fed with more power than the FCC authorizes, providing the power didn't sizzle up the wire used to construct the antenna!

LET'S BUILD IT!

The author has had no experience with vertically mounted Rhombic antennas. It is assumed, however, that all one needs to do is to flip the "diamond" up on its side as shown in Figure 3, mounting it sufficiently above ground at point B to be at least one wavelength (36 feet) between the insulator and the ground level.

The horizontal Rhombic antenna shown is a terminated device, with a terminating "load resistor" across the wires at point A in Figure 4. This resistor is an 800 ohm noninductive (carbon-only!) type. This resistor is very important, as it keeps your signal from floating off the back side of the antenna. The wattage of the resistor should approximately equal your transmitter power output.

Point B in diagram 4 shows an in-

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sert, 4A, which explains how you match the 800 ohm Rhombic antenna to your 52 ohm coaxial transmission line. This is a "Q matching section," constructed from ½ inch O.D. aluminum or copper tubing, spaced apart by plastic spacers 1-5/16th inches center to center. The Q Matching section is 8 feet 9½ inches long, from the top where it attaches to the *fire-end* of the Rhombic, to the base where the RG-8U coax cable from your transceiver attaches on. The Q Matching section transforms your feed impedance to 800 ohms, matching the antenna. If there is sufficient interest in this matching system, we can go into it further at a later time.

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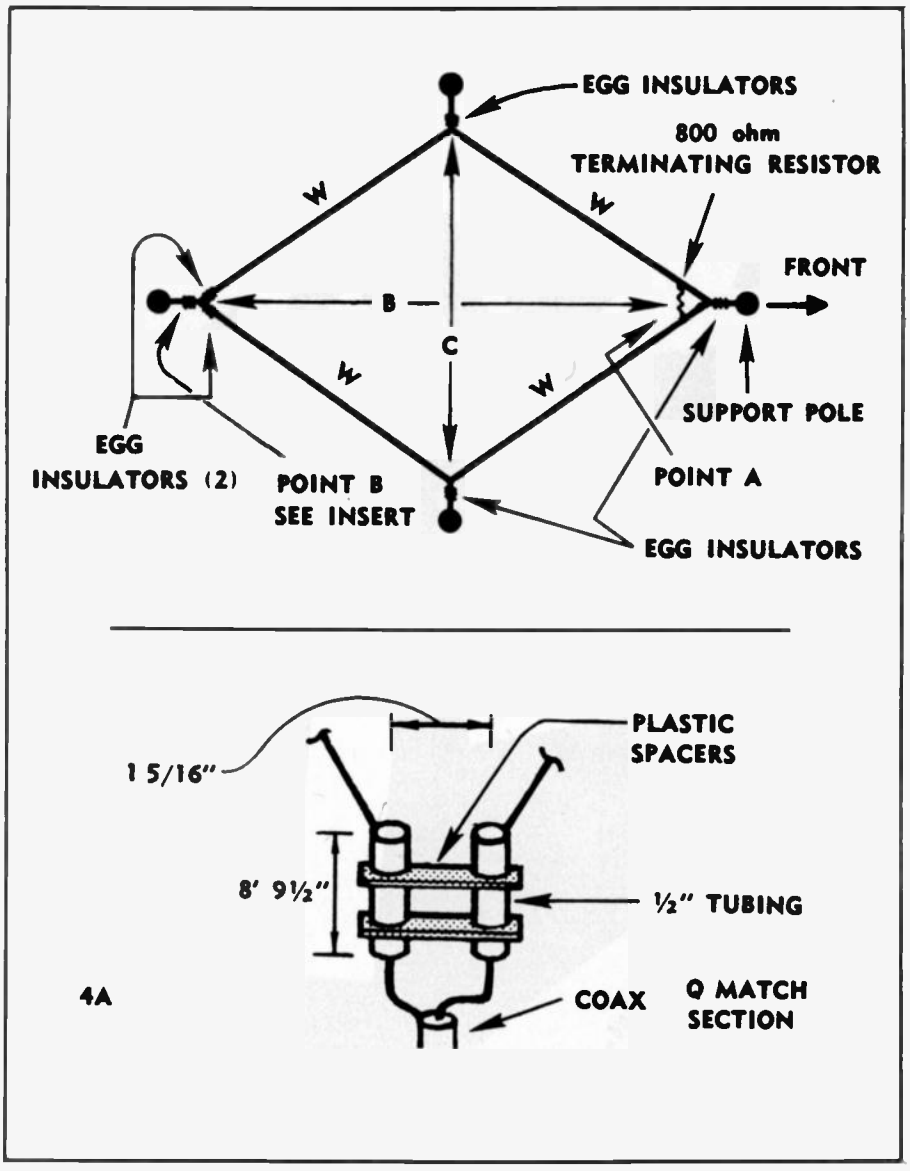

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4	50	degrees	126.5	6.0
8	35	degrees	252	9.25
12	22.5	degrees	378	12.5

This will give you the different measurements and gains for the various sizes of rhombics.